

Geochemical analysis and familial association of Winnipeg reservoired oils of the Williston Basin, Canada

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ABSTRACT

Petroleum production from Ordovician strata in the Canadian portion of the Williston Basin is over 2 million cubic meters making it the third most prolific play in the Basin. Geochemical evidence has proven that the main source of the Ordovician oils is from the Upper Ordovician Red River Formation kukersites. However, little was known about the oils of the Lower Ordovician Winnipeg Formation, specifically their geochemical characteristics, the location of their source (or sources) and the petroleum system they belong to. That is because there was very little information available due to a lack of oil and core samples. Recent production from the Lower Ordovician Winnipeg Formation and the discovery of potential source rocks in the Icebox Member has promoted renewed interest for an additional Ordovician petroleum system and increased the amount of data available.

Geochemical comparison of Winnipeg reservoired oils and stratigraphically adjacent Red River oils, including gasoline range, saturate fraction and biomarker analysis, unequivocally show that Winnipeg oils originate from a unique source previously undefined in the basin. However, the source of the Winnipeg oils remains unresolved. Therefore, the latter part of this study focuses on oil-source correlation between Winnipeg oils and potential source rocks, including the Ordovician Winnipeg Formation and the Cambrian Deadwood Formation. Extracts from potential source rocks were analyzed by GC, GCMS techniques and characterized by saturate fraction gas chromatography, terpane and sterane biomarkers and in the aromatic fraction.

This study sheds new light upon the Ordovician petroleum systems of the 'Williston Basin'.